PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-356377
(43)Date of publication of application : 13.12.2002

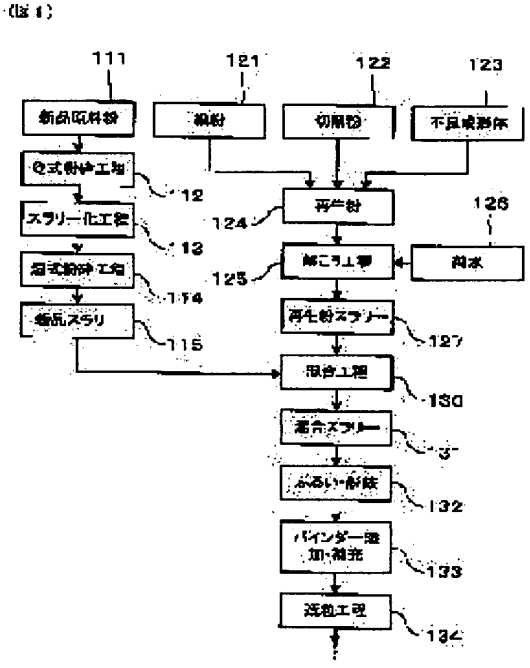
(51)Int.Cl. C04B 35/622
B28B 11/08
G01N 27/409

(21)Application number : 2001-167177
(22)Date of filing : 01.06.2001

(71)Applicant : DENSO CORP
(72)Inventor : INADA HIROSHI

(54) METHOD OF MANUFACTURING CERAMIC COMPACT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method of manufacturing a ceramic compact capable of reusing wastes and defectives generated in the manufacturing processes.
SOLUTION: The ceramic compact is manufactured by the processes as follows: a fine powder eliminating process eliminating fine powder smaller than predetermined size from granulated powder in the slurry; a forming process forming the primary formed compact from the slurry containing the granulated powder; a grinding process grinding the obtained primary formed compact into expected shape to be fired; a deflocculating process 125 deflocculate the fine powder ≤5 μm eliminated in the fine powder eliminating process so as to contain by ≥50 wt.%, and also mixing water to obtain reclaimed slurry; and thereby the obtained reclaimed slurry is at least formed into the formed compact to be fired, then it is fired.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The fine powder removal process of removing the fine powder of under the diameter of predetermined from the granulation powder in a slurry, The forming cycle which makes the slurry containing granulation powder with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, The amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio, The manufacture approach of the ceramic object characterized by fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object.
[Claim 2] The forming cycle which makes the slurry containing granulation powder with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, While carrying out amalgam decomposition of the grinding powder collected in the grinding powder recovery process of collecting the grinding powder generated in the grinding operation, and the recovery process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio The manufacture approach of the ceramic object characterized by the amalgam-decomposition process which mixes water and obtains a playback slurry, and fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object.
[Claim 3] The inspection process which inspects a non-calcinated form and removes a defect Plastic solid, and the defect Plastic solid recovery process of collecting the defect Plastic solids removed in the inspection process, The amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the defect Plastic solid collected in the defect Plastic solid recovery process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio, The manufacture approach of the ceramic object characterized by fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object.
[Claim 4] The fine powder removal process of removing the fine powder of under the diameter of predetermined from the granulation powder in a slurry, The forming cycle which makes a granulation ****** slurry with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, The amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that it may become a primary particle, This amalgam-decomposition process is the manufacture approach of the ceramic object characterized by carrying out carrying out a vacuum deairing, fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object.
[Claim 5] It is the manufacture approach of the ceramic manufacture object characterized by setting the degree of vacuum of an amalgam-decomposition process to -53--80kPa in the vacuum deairing in the above-mentioned amalgam-decomposition process in claim 4.
[Claim 6] The above-mentioned amalgam-decomposition process is the manufacture approach of the ceramic object characterized by carrying out amalgam decomposition so that a particle with a particle diameter of 2 micrometers or less may be contained 90% or more by the weight ratio in any 1 term of claims 1-5.
[Claim 7] The manufacture approach of the ceramic object characterized by mixing the new article slurry obtained from the granulation process which slurs new article raw material powder at least, and makes the

primary particle in this slurry with granulation powder to the above-mentioned playback slurry in any 1 term of claims 1-6.

[Claim 8] The slurrying process which obtains a new article slurry from the granulation process which slurs new article raw material powder and makes the primary particle in this slurry with granulation powder, The fine powder removal process of removing the fine powder of under the diameter of predetermined from the granulation powder in a slurry, The forming cycle which makes a granulation ****** slurry with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, In the amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that it may become a primary particle, the mixed process which introduces the above-mentioned new article slurry to a playback slurry, and this mixed process It is the manufacture approach of the ceramic object which introduces a playback slurry first, introduces the above-mentioned new article slurry and a playback slurry by turns after that, calcinates a non-calcinated form, turns into a ceramic object from the baking process to make, and is characterized by performing the granulation process in the process after the 2nd times using a mixed slurry.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the ceramic object used for the solid electrolyte object used for example, for various gas sensor components, an insulating substrate, etc.

[0002]
[Description of the Prior Art] A binder is introduced and slurred into new article raw material powder, this slurry is fabricated, and a non-calcinated form is acquired. The method of acquiring a ceramic object by calcinating this non-calcinated form is learned well conventionally.
[0003]
[Problem(s) to be Solved] Using effectively the scrap wood generated in the process of shaping and a defective from reduction of raw material cost or a viewpoint of resource protection in the manufacture approach of a ceramic object in recent years is called for.
[0004] This invention was made in view of this conventional trouble, and tends to offer the manufacture approach of the ceramic object which can reuse the scrap wood produced in the production process, and a defective.
[0005]
[Means for Solving the Problem] The fine powder removal process that the 1st invention removes the fine powder of under the diameter of predetermined from the granulation powder in a slurry, The forming cycle which makes the slurry containing granulation powder with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, The amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio, The manufacture approach of the ceramic object characterized by fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object. It is alike and is (claim 1).
[0006] The forming cycle to which the 2nd invention makes the slurry containing granulation powder with a primary Plastic solid, The grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, While carrying out amalgam decomposition of the grinding powder collected in the grinding powder recovery process of collecting the grinding powder generated in the grinding operation, and the recovery process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio It is in the manufacture approach of the ceramic object characterized by the amalgam-decomposition process which mixes water and obtains a playback slurry, and fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object (claim 2).
[0007] The inspection process which the 3rd invention inspects a non-calcinated form and removes a defect Plastic solid, The defect Plastic solid recovery process of collecting the defect Plastic solids removed in the inspection process, The amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the defect Plastic solid collected in the defect Plastic solid recovery process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio, It is in the manufacture approach of the ceramic object characterized by fabricating a non-calcinated form by the playback slurry obtained at least, calcinating, and making with a ceramic object (claim 3).

[0008] The fine powder removal process that the 4th invention removes the fine powder of under the diameter of predetermined from the granulation powder in a slurry, The forming cycle which makes a granulation ****** slurry with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, The amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that it may become a primary particle, It is in the manufacture approach of the ceramic object characterized by performing it, carrying out the vacuum deairing of this amalgam-decomposition process, fabricating a non-calcinated form by the playback slurry obtained at least, calcinating it, and making it with a ceramic object (claim 4).

[0009] The slurrying process which obtains a new article slurry from the granulation process at which the 5th invention makes the primary particle in this slurry with granulation powder, The fine powder removal process of removing the fine powder of under the diameter of predetermined from the granulation powder in a slurry, The forming cycle which makes a granulation ****** slurry with a primary Plastic solid, and the grinding operation which carries out grinding of the acquired primary Plastic solid, and is made with the non-calcinated form of a desired configuration, In the amalgam-decomposition process which mixes water and obtains a playback slurry while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that it may become a primary particle, the mixed process which introduces the above-mentioned new article slurry to a playback slurry, and this mixed process Introduce a playback slurry first, introduce the above-mentioned new article slurry and a playback slurry by turns after that, and a non-calcinated form is calcinated. It consists of a ceramic object and a baking process to make, and the granulation process in the process after the 2nd times is in the manufacture approach of the ceramic object characterized by carrying out using a mixed slurry (claim 8).

[0010] It generates on the process which acquires a ceramic object from new article raw material powder, and each of the 1st - 5th invention is creating the non-calcinated form using the playback slurry obtained by collecting the components containing the new article raw material powder discarded when it was the former. That is, in the 1st, 4th, and 5th invention, although the fine powder of under the diameter of predetermined is removed from the granulation powder in a slurry in a fine powder removal process, this fine powder is reused. In the 2nd invention, the grinding powder produced when carrying out grinding of the primary Plastic solid is collected and reused. Moreover, this is collected and reused although the substandard article carried out [exceed / a defect Plastic solid, i.e., a dimension etc., / by the inspection process / tolerance] is removed in the 3rd invention.

[0011] For this reason, according to the 1st - the 5th invention, new article raw material powder is effectively utilizable. Thus, this invention can offer the manufacture approach of the ceramic object which can reuse the scrap wood produced in the production process, and a defective.

[0012]

[Embodiment of the Invention] In the 1st above-mentioned invention (claim 1), amalgam decomposition of the fine powder removed in the fine powder removal process is carried out so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio. A particle with a particle diameter of 5 micrometers or less is magnitude comparable as the primary particle in new article raw material powder, and a playback slurry can be made into the same condition as a new article slurry by carrying out amalgam decomposition of the 50% or more of the total weight of fine powder to the above-mentioned particle size. When a particle with a particle diameter of 5 micrometers or less is less than 50% in a weight ratio temporarily, the lack of on the strength arises on the created ceramic object, and there is a possibility that a crack etc. may enter. Moreover, the case where all particles are 5 micrometers or less is the most desirable.

[0013] Moreover, the above-mentioned amalgam decomposition can be performed using an agitator besides churning which used the Taira wing, and a biaxial butterfly etc. (it is each referring to the example for details). By using the Taira wing, the whole slurry can be agitated and sufficient amalgam decomposition can be realized.

[0014] Moreover, since a big aggregate can be cracked and amalgam-decomposition distribution can be performed to coincidence by using a biaxial butterfly, when especially a slurry has high viscosity, efficient amalgam decomposition can be realized. Moreover, while being able to apply shearing force to a slurry and performing amalgam decomposition efficiently by using an agitator, the rate of amalgam decomposition can be raised.

[0015] Also in the 2nd above-mentioned invention (claim 2), amalgam decomposition of the grinding

powder collected in the grinding powder recovery process is carried out so that this 90% of the weight or more of whole grinding powder weight may serve as a primary particle. It is the same as that of the 1st above-mentioned invention for details.

[0016] Also in the 3rd above-mentioned invention (claim 3), amalgam decomposition of the defect Plastic solid collected in the defect Plastic solid recovery process is carried out so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio. It is the same as that of the 1st above-mentioned invention for details.

[0017] In the 4th above-mentioned invention (claim 4), while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process so that it may become a primary particle, the amalgam-decomposition process which mixes water and obtains a playback slurry is performed. This amalgam-decomposition process is performed where a vacuum deairing is carried out. That is, the container and instrument which perform an amalgam-decomposition process are sealed, a vacuum pump etc. is connected, and it considers as the condition of having decompressed the interior. It is hard to produce the granulation powder as for which the bubble stopped being able to form easily and the internal cavity and the hole were vacant by this, and the defect at the time of shaping can be prevented.

[0018] Next, in the vacuum deairing in the above-mentioned amalgam-decomposition process, it is desirable to set the degree of vacuum of an amalgam-decomposition process to -53--80kPa (claim 5). Degassing in the condition near a vacuum is performed by this, and the slurry which does not almost have air bubbles can be obtained. When a degree of vacuum is less than -53 kPas, there is a possibility of becoming insufficient [degassing]. When a degree of vacuum exceeds -80kPa, a slurry foams within an amalgam-decomposition tank and there is a possibility of being hard that it may come to obtain desired granulation powder, in the granulation process of a back process etc.

[0019] Moreover, it is desirable to carry out amalgam decomposition of the above-mentioned amalgam-decomposition process so that a particle with a particle diameter of 2 micrometers or less may be contained 90% or more by the weight ratio (claim 6). Thereby, effectiveness equivalent to a new (new material) slurry can be acquired. When a particle with a particle diameter of 2 micrometers or less is less than 90% in a weight ratio, there is a possibility that a crack may go into the fabricated ceramic object. Moreover, the case where all particles are 2 micrometers or less is the most desirable.

[0020] Moreover, it is desirable to mix the new article slurry obtained from the granulation process which slurs new article raw material powder at least, and makes the primary particle in this slurry with granulation powder to the above-mentioned playback slurry (claim 7). Thereby, foaming decreases. In addition, a Plastic solid can also be created only by the playback slurry temporarily.

[0021] In the 5th above-mentioned invention (claim 8), in a mixed process, a playback slurry is introduced first and a new article slurry and a playback slurry are introduced by turns after that. This is repeated until the container which performs a mixed process is filled with the slurry of the amount of requests. Thus, due to mixing a playback slurry and a new article slurry, a bubble stops being able to form easily. This stops easily being able to produce the granulation powder as for which the internal cavity and the hole were vacant, and the defect at the time of shaping can be prevented. Reinforcement tends to run short, it is easy to produce a crack, and the primary Plastic solid fabricated from the granulation powder as for which the internal cavity and the hole were vacant is not desirable.

[0022] In addition, in the 5th invention, it is a procedure of a playback slurry -> new article slurry -> playback slurry, and it is desirable to divide and introduce into at least 3 times. Moreover, the procedure of a new article slurry -> playback slurry -> new article slurry may be used.

[0023]

[Example] A drawing is used for below and the example of this invention is explained to it.

(Example 1) The manufacture approach of the ceramic object concerning this invention is explained as shown in drawing 1 - drawing 8 . First, the outline of the manufacture approach is explained. New article raw material powder is prepared, the dry grinding process which carries out dry grinding, the slurrying process which makes the ground new article raw material powder with a slurry, and a slurry are agitated, and the wet-grinding process which obtains a new article slurry, and the granulation process which makes the primary particle in a slurry with granulation powder are performed. In addition, the fine powder removal process of removing the fine powder of under the diameter of predetermined from the granulation powder in a slurry is performed.

[0024] Moreover, the non-calcinated form of a desired configuration and the grinding operation to make are performed by carrying out grinding of the acquired primary Plastic solid to the forming cycle which makes a granulation ****** slurry with a primary Plastic solid. In addition, the grinding powder recovery process of

collecting the grinding powder generated in the grinding operation is performed. Moreover, the inspection process which inspects a non-calcinated form and removes a defect Plastic solid, and the defect Plastic solid recovery process of collecting the defect Plastic solids removed in the inspection process are performed.
[0025] And while carrying out amalgam decomposition of the fine powder removed in the fine powder removal process, the grinding powder collected in the recovery process, and the defect Plastic solid collected in the defect Plastic solid recovery process so that a particle with a particle diameter of 5 micrometers or less may be contained 50% or more by the weight ratio, the amalgam-decomposition process which mixes water and obtains a playback slurry is performed. And the mixed process which introduces the above-mentioned new article slurry to the obtained playback slurry is performed.
[0026] The non-calcinated form acquired according to the above process can be calcinated, a desired ceramic object can be acquired, and the granulation process in the process after the 2nd times is performed using a mixed slurry.
[0027] Hereafter, it explains to a detail. It comes, whenever the ceramic object of this example is shown in drawing 7 and drawing 8 , and it is used as an oxygen ion conductivity solid electrolyte object 21 of the closed-end cylinder in the gas sensor component 2 of a cop mold. The above-mentioned gas sensor component 2 has the ground electrode 212 by the side of the measured gas formed in the front face 202 of the outside of the solid electrolyte object 21 made from a zirconia of oxygen ion conductivity, and this solid electrolyte object 21, and the inside electrode 211 which meets the criteria gas chamber 21 where the atmospheric air used as reference gas is introduced at the time of use of the solid electrolyte object 21 interior.
[0028] Moreover, the lead section and the terminal area for pulling out the output of the gas sensor component 2 outside are prepared in one with inside ****** 211 ********** 212 to the inside front face 201 and the outside front face 202, respectively (illustration abbreviation). In addition, the above-mentioned inside and a ground electrode 211,212 are platinum electrodes.
[0029] The thermal-spraying layer 22 made from an alumina ceramic in which the front face 220 of a ground electrode 212 has some permeability formed by the plasma metal spray is formed, and the front face 230 of this thermal-spraying layer 22 is covered with the porous layer 23. This porous layer 23 is constituted so that it may function as a trap layer which carries out the trap of the poisoning matter contained in the exhaust gas which is measured gas. The thermal-spraying layer 22 is constituted so that it may function as a diffused-resistor layer for controlling the time of concentration and the amount of attainment to a ground electrode of measured gas.
[0030] Next, the manufacturing facility of the above-mentioned ceramic object is explained. In addition, the manufacturing facility was divided into drawing 3 - drawing 5 , and was indicated, and A, B, and C showed the connection part in each drawing. The above-mentioned manufacturing facility has the platform scale 312 for transporting these using a strainer or a screw feeder from the tank 311 which accumulates the collected fine powder, cutting powder, and a defect Plastic solid, and this tank 311, and the check platform scale 313 which transport these platform scale 312 while measuring to an amalgam-decomposition tank, as shown in drawing 3 .
[0031] Moreover, as shown in drawing 4 , pure water is stored and it has the demineralised water tank 323 which sends in pure water to the amalgam-decomposition tank 330 if needed, and the suction type transport apparatus 324 which sends fine powder, cutting powder, and a defect Plastic solid into the amalgam-decomposition tank 330 using Ayr from the check platform scale 313. Moreover, as for the amalgam-decomposition tank 330, the agitator is prepared, and this agitator consists of a mechanical component 333, a rotor 331, and a stator 332.
[0032] An agitator's rotor 331 and stator 332 are shown in a detail at drawing 6 . As shown in this drawing, a rotor 331 consists of the annular body 374, two or more heights projected in the drawing lower part from this annular body 374, 375, and three support shafts 376 extended from the annular body 374 to the drawing upper part.
[0033] Moreover, a stator 332 becomes the periphery of the disc-like body 371 and this body 371 from two or more heights 372 projected to the drawing upper part. It will be somewhat smaller than the path of a rotor 331, a rotor 331 will be contained from the height 372 of a stator 332 at an inner circumference side, and the path of a stator 332 will rotate in this. In addition, it connects with the mechanical component 333 of the amalgam-decomposition tank 330 exterior, and a rotor 331 rotates the support shaft 376 prepared in the rotor 331 by the mechanical component 333.
[0034] Moreover, in order to decompress the inside of the amalgam-decomposition tank 330, the vacuum pump 336 is formed, and between the amalgam-decomposition tank 330 and the vacuum pump 336, fine

powder, cutting powder, a defect Plastic solid, etc. reach a vacuum pump 336, and in order to prevent damaging a vacuum pump 336, the dust collector 335 is formed.

[0035] As shown in drawing 5 , two sets of the slurry tanks 341,342 with which a playback slurry is sent out are prepared from the amalgam-decomposition tank 330, and the sending-out pump 337 which performs the above-mentioned sending out is formed among both. Moreover, the above-mentioned slurry tank 341,342 is equipped with the stirrer 343,344, respectively. A mixed slurry is obtained from a playback slurry and a new article slurry with this slurry tank 341,342.

[0036] Moreover, the sending-out pump 345 for sending out a mixed slurry to a service tank 353 is formed from the above-mentioned slurry tank 341,342, the vibration screen 351 and the deferrization machine 352 are formed before the service tank 353, and the stirrer 360 is formed in the service tank 353. Moreover, it has the spray drier 360 connected with the service tank 353.

[0037] Next, the manufacture approach of the ceramic object concerning this example is explained. First, as shown in step 111 of drawing 1 , zirconia powder and yttria powder are prepared as new article raw material powder. As these are shown in step 112, it introduces into a vibration mill and a dry grinding process is performed. Thereby, grain refining of the new article raw material powder was carried out to some extent.

[0038] Subsequently, water is thrown in for the new article raw material powder by which grain refining was carried out, and new article raw material powder is stirred and slurred after that. This is the slurrying process of step 113. In addition, a binder is not introduced at this time.

[0039] Subsequently, as shown in step 114, the above-mentioned slurry is unfolded using a vibration mill, a slurry is agitated, and a wet-grinding process is performed. This obtains the new article slurry in which the particle whose particle size is 2 micrometers or less contains the primary particle which occupied 90% or more of the whole, as shown in step 115.

[0040] By the way, as shown in steps 121-123, the fine powder collected in the process in the middle of each process mentioned later, cutting powder, and a defect Plastic solid are brought together in the tank 311 applied to drawing 3 , respectively. From a tank 311, it transports to the check platform scale 313 from platform scale 312, and pneumatic transportation is carried out to an amalgam-decomposition tank here, measuring. In addition, since fine powder, cutting powder, and defect Plastic solids are collected from the separate part of each process, it can store on another tank at the beginning, but in case it measures in the check platform scale 313, it is collected as shown in step 124. Hereafter, fine powder, cutting powder, and a defect Plastic solid are collectively indicated to be playback powder.

[0041] in addition, already to some extent [a defect Plastic solid is a non-calcinated form with which neither a dimension nor a configuration fills a convention, as mentioned later, but / in order to use a dust collector at the time of recovery from a process / in case it breaks with nature at the time of recovery and is stored in a tank 311] -- it is powdered. For this reason, a non-set has [playback powder] a powdered particle size, and an average particle size is 60-100 micrometers.

[0042] And the suction type transport apparatus 324 is used and introduced into the amalgam-decomposition tank 330 which shows the above-mentioned playback powder to the specified quantity and drawing 4 . In the case of installation, as pure water is introduced into the amalgam-decomposition tank 330 at coincidence and it is shown in step 125, amalgam decomposition of the playback powder is carried out, and as shown in step 126 from the demineralised water tank 323 shown in drawing 4 , as shown in step 127, a playback slurry is obtained.

[0043] Amalgam decomposition of this step 125 is explained to a detail. Pure water is introduced into the amalgam-decomposition container 330 with playback powder. The agitator set to the amalgam-decomposition container 330 at the time of this installation is driven. The introduced playback powder is 200kg, pure water is 170kg, and the frequency of an agitator drive is 10Hz. Subsequently, the amalgam-decomposition container 330 is decompressed by the vacuum pump 336 connected through the dust collector 335, and degassing of the mixture of playback powder and pure water is carried out. The agitator drive frequency at the time of degassing is 25Hz, and the inside of the amalgam-decomposition container 330 is held at -53--80kPa. In addition, it continues 30 minutes or more and degassing is performed.

[0044] Next, the inside of the amalgam-decomposition container 330 is agitated, using an agitator's drive frequency as 40Hz. At this time, the inside of the amalgam-decomposition container 330 was set to -65--100kPa. Moreover, amalgam decomposition was performed for 1.5 hours. Thereby, amalgam decomposition of the playback powder was carried out to the mean particle diameter of 0.5-0.6 micrometers comparable as a new primary particle. And a pump 337 sends out the playback slurry in the amalgam-decomposition container 330 to two sets of slurry tanks 341,342. In addition, 40kg of pure water is introduced after this sending out, an agitator is driven for 5 minutes by 5Hz of drive frequencies, and while washing the inside of

the amalgam-decomposition container 330, the playback slurry which adhered in the container 330 is sent out.

[0045] Next, as shown in step 130, in the above-mentioned slurry tank 341,342, the new article slurry and playback slurry which were mentioned above are mixed. At this time, a playback slurry and a new article slurry are introduced by turns, the above-mentioned slurry tank 341,342 is filled with the specified quantity, respectively, and a mixed process is performed.

[0046] That is, a playback slurry is first introduced into a slurry tank 341. At this time, the path of a playback slurry of facing to a slurry tank 342, and the path of a new article slurry stop by a bulb etc., respectively. After introducing the playback slurry of the specified quantity, the path of a playback slurry of facing to a slurry tank 341 is closed, and a playback slurry is introduced to a slurry tank 342, a new article slurry opening wide the path which faces to a slurry tank 341, and introducing a new article slurry into a slurry tank 341, while opening the path of a playback slurry of facing to a slurry tank 342.

[0047] Then, after introducing the new article slurry and playback slurry of the specified quantity into a slurry tank 341,342, respectively, again, a playback slurry is introduced into a slurry tank 341, and a new article slurry is shortly introduced into a slurry tank 342. Repeating such a procedure, first, further, the degree is a playback slurry and a procedure of a new article slurry, and introduces [at a playback slurry and a degree] a playback slurry and a new article slurry into both the slurry tanks 341,342 a new article slurry and its degree. In addition, it agitates during the activity of the above-mentioned installation by driving the stirrer 343,344 formed in each slurry tank 341,342. A mixed slurry is obtained as shown in step 131 from the above mixed process.

[0048] After a mixed slurry is fully agitated, a pump 345 sends out to a service tank 353. In addition, before the service tank 353, the vibration screen 351 and the deferrization machine 352 are formed, and as shown in step 132, that whose particle size is size is removed by the vibration screen 351 by the particle in a mixed slurry. Moreover, the iron powder (since it is usually transported in a pipe etc. between each process, the iron of piping may often mix it) mixed as an impurity especially in playback powder is removed by the deferrization machine 352. In addition, the above-mentioned deferrization machine 352 consists of an electromagnet.

[0049] In step 133, the binder which is adhesives is introduced into a mixed slurry until it becomes predetermined concentration within a service tank 353. A supplement of the binder which a mixed slurry runs short of in acquiring a primary Plastic solid at subsequent processes while still more sufficient churning is carried out by the stirrer 354 in a service tank 353 is performed. That is, since playback powder is collected from Ushiro's process that the binder was already introduced, it is in the condition that a certain amount of quantity of the binder adhered. Therefore, the playback slurry contains the binder. Therefore, the binder introduced in the process of step 133 is the amount of extent with which an insufficient part is compensated at the time of shaping. Moreover, the amount of supplementation of the above-mentioned binder is beforehand calculated from the rate to the new article slurry of a playback slurry. And a mixed slurry is sent out from a service tank 353 to a spray drier 360.

[0050] Subsequently, at step 134, a mixed slurry is introduced into a spray drier and corned (granulation process). The fine powder which did not reach a predetermined particle size at step 135 of drawing 2 using the screen from the obtained granulation powder is removed (fine powder removal process). the fine powder removed here is boiled and transported to step 121, and is used as playback powder. Subsequently, the forming cycle of the slurry containing the granulation powder obtained at step 136 is performed, and as shown in step 137, it makes with a primary Plastic solid. The grinding operation which carries out grinding of this to a configuration predetermined in step 138 with a grinding stone is performed, and as shown in step 140, it considers as a non-calcinated form with a predetermined configuration. At the grinding powder recovery process of step 139, since the grinding powder generated in this grinding is in process, it is recovered by the dust collector, and it is used as playback powder at step 122 of drawing 1 .

[0051] Subsequently, it is inspected whether the acquired non-calcinated form has a predetermined configuration and a dimension in the inspection process of step 141. At the defect Plastic solid recovery process of step 142, with a dust collector, since what was distinguished as a defect Plastic solid in this inspection process is in process, it is collected, and it is used as playback powder at step 123. In addition, in case it is recovered by this dust collector, a defect Plastic solid is pulverized and becomes powder-like.

[0052] And atmospheric-air baking of the above-mentioned non-calcinated form is carried out at the baking process of step 143, and as shown in step 144, the ceramic object concerning this example is acquired. Then, plating formation of the inside and the ground electrode 211,212 is carried out on the front face of this ceramic object, whenever the thermal-spraying layer 22 is shown in drawing 7 and drawing 8 by forming a

porous layer 23 by dipping further to a ground electrode 212 by the plasma metal spray, it comes, and the gas sensor component 2 can be obtained.

[0053] Next, the operation effectiveness of this example is explained. It generates on the process which acquires a ceramic object from new article raw material powder, and this example collects and carries out amalgam decomposition of that it was considered that was a defect Plastic solid by the grinding powder produced when carrying out grinding of the fine powder and the primary Plastic solid which are collected at the fine powder removal process discarded when it was the former, and the inspection process, and mixes it to a new article slurry as a playback slurry. A non-calcinated form is produced through various kinds of processes from such a mixed slurry, and a ceramic object is acquired by baking. For this reason, according to this example, there is no futility and new article raw material powder can be utilized effectively. Therefore, according to this example, the manufacture approach of the ceramic object which can reuse the scrap wood produced in the production process and a defective can be offered.

[0054] Furthermore, while being able to apply shearing force to a slurry and performing amalgam decomposition efficiently by using an agitator for churning in an amalgam-decomposition process, the rate of amalgam decomposition can be raised. Moreover, the amalgam-decomposition process is performed where a vacuum deairing is carried out. Granulation powder as for which the bubble stopped being able to form easily and the internal cavity and the hole were vacant by this can be made hard to produce. Therefore, poor shaping at the time of making a primary Plastic solid can be prevented.

[0055] In the above-mentioned amalgam decomposition, the example of two examples is changed into an agitator, and explains the approach using the Taira wing, and the approach using a biaxial butterfly, respectively. As shown in drawing 9 , the Taira wing 41 of a configuration of having formed the wing 413 with shaft 412 in the direction which intersects perpendicularly with a revolving shaft 411 and this revolving shaft 411 is installed in an amalgam-decomposition container.

[0056] As shown in drawing 10 , the biaxial butterfly 42 which combined the turbine mold impeller 420 and the butterfly wing 43 is installed in an amalgam-decomposition container. The butterfly wing 43 consists of a medial axis 431 perpendicularly projected from the core of the body 432 of a disk, and this body 432 of a disk. Two or more lobes 433,434 open predetermined spacing in the hoop direction of the body 432 of a disk, and are arranged at the periphery of the body 432 of a disk so that it may project in the upper part of this body 432 of a disk, and a lower part.

[0057] Churning in an amalgam-decomposition container can be performed by making it rotate at the time of amalgam decomposition, respectively like the rotor of the agitator who showed these Taira wings 41 and the biaxial butterfly 42 to the example 1. In addition, the direction of rotational was illustrated as an arrow R to drawing 9 R> 9 and drawing 10 .

[0058] Next, it measured about the case where each of (1) Taira wing, (2) agitators, and (3) biaxial butterfly is used about the amalgam-decomposition distribution property of playback powder. A parameter is explained. First, amalgam decomposition was performed using each of (1) - (3). Playback powder measured the condition of having carried out amalgam decomposition, with the SEDI graph grain-size plan. The particle eliminated in 2-micrometer screen by this measurement was [(1)] 94 % of the weight in (3) 94% of the weight 93% of the weight of whole weight (2).

[0059] Moreover, for the time amount taken to reach the condition of having mentioned above (for example, the particle eliminated with 2-micrometer screen in (1) is the time amount which comes to occupy 93% of the weight of whole weight.), i.e., amalgam-decomposition time amount, as for (2), (1) was [(3)] 6 hours for 2 hours for 10 hours.

[0060] Moreover, when the condition of amalgam-decomposition Ushiro's particle was observed about each of (1) - (3) with the scanning electron microscope, there is no particle which condensed all and all were carrying out amalgam decomposition to the condition of a primary particle. Moreover, when the viscosity of amalgam-decomposition Ushiro's playback slurry was measured, for (1), 500cps and (2) were [240cps and (3)] 220cps. In addition, an amalgam-decomposition container was not pulled to a vacuum at the time of churning by the Taira wing of (1), but it performed it by ordinary pressure. Thus, even if it used which amalgam-decomposition approach of having used the means concerning (1) - (3), the playback slurry which fully carried out amalgam decomposition was able to be obtained. Therefore, amalgam decomposition was fully able to be carried out, the mixed slurry which consists of a particle which became small could be obtained from the playback slurry concerning (1) - (3), and the ceramic object produced from this mixed slurry was able to acquire the outstanding property equivalent to the ceramic object produced from the new slurry.

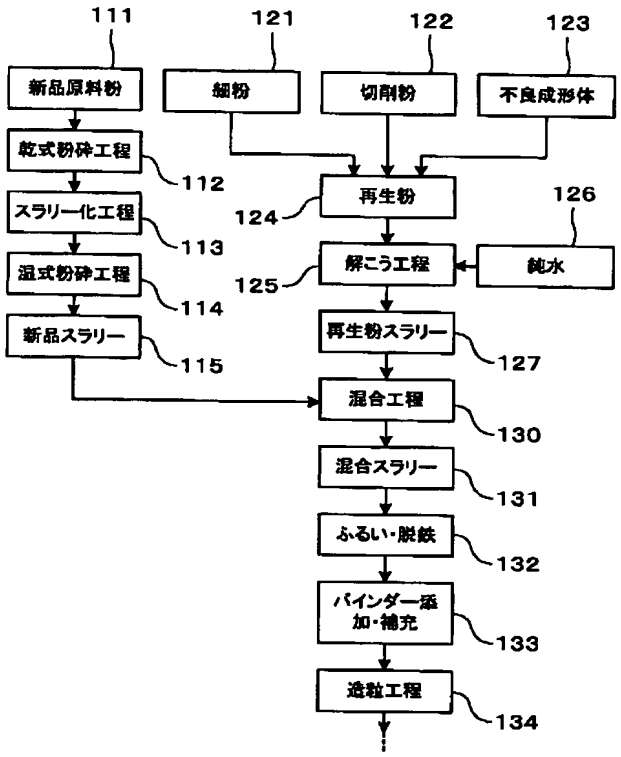
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

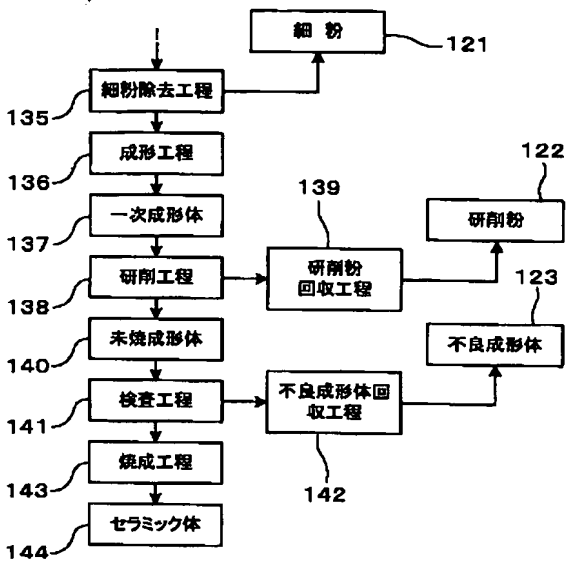
DRAWINGS

[Drawing 1]
(図1)



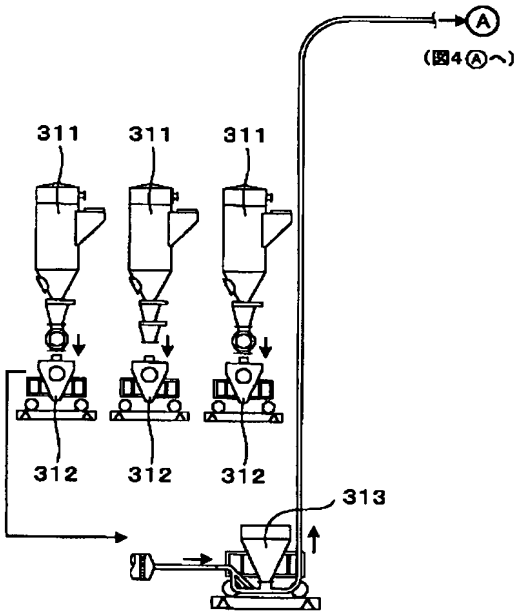
[Drawing 2]

(図2)



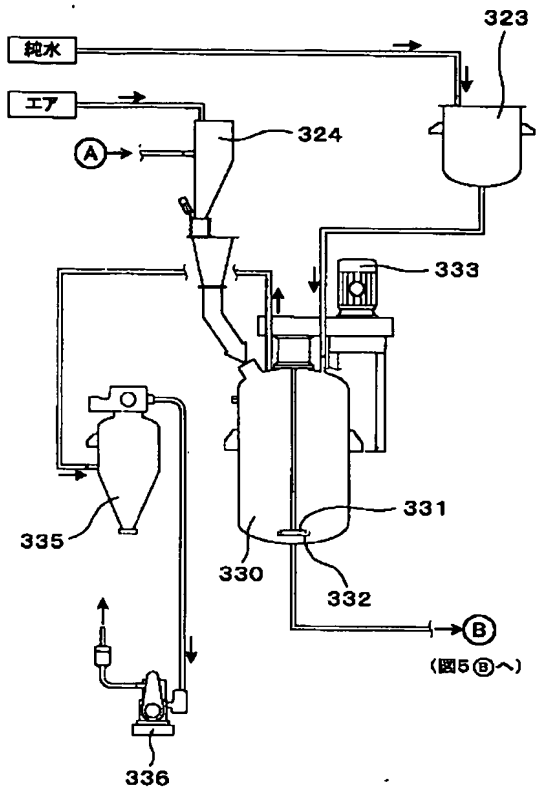
[Drawing 3]

(図3)

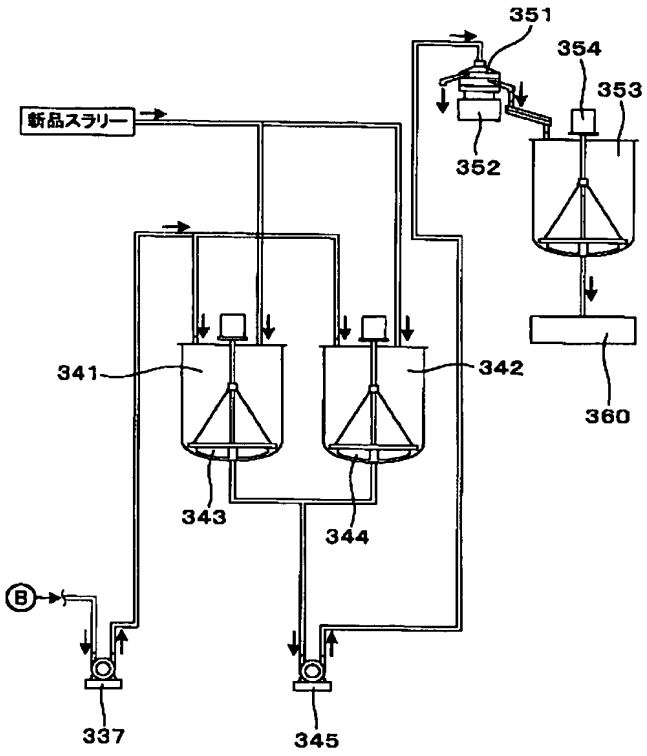


[Drawing 4]

(図4)

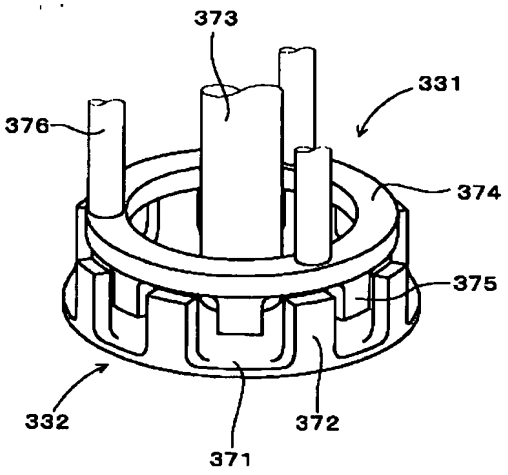


[Drawing 5]
(図5)

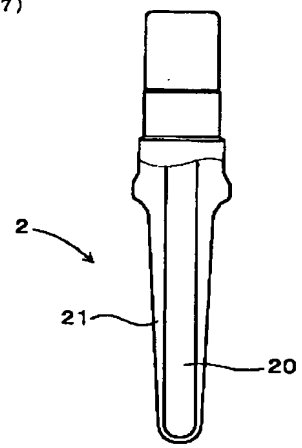


[Drawing 6]

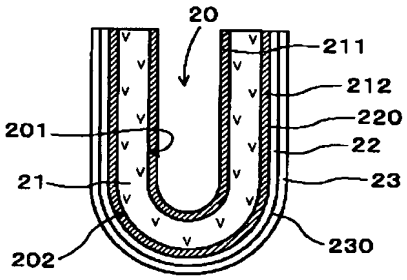
(図6)



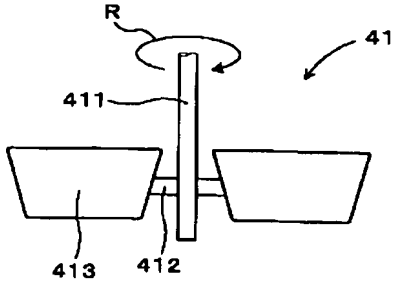
[Drawing 7]
(図7)



[Drawing 8]
(図8)

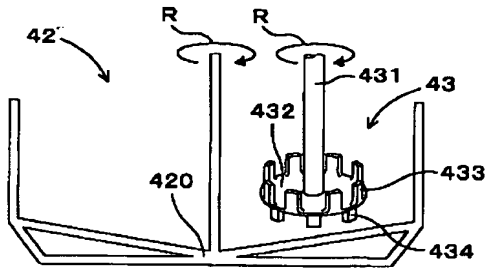


[Drawing 9]
(図9)



[Drawing 10]

(図10)



[Translation done.]